

WHAT IS CLAIMED IS:

1. A silicon optic based wavelength division multiplexer (WDM) device,
comprising:
a silicon substrate, having a plurality of grooves, the grooves for inserting and
coupling fiber optics, lenses, and filters,
a plurality of fiber optics, inserted and coupled inside the grooves of the silicon
substrate, fiber-to-fiber coupling being done by lenses,
a plurality of lenses, inserted and coupled inside the grooves of the silicon
substrate, for coupling fiber optics, and for focusing and diverging lights,
and
at least a filter, inserted and coupled inside the grooves of the silicon substrate,
for passing or reflecting lights with different wavelengths.
2. The device as claimed in Claim 1, wherein the grooves are formed by etching.
3. The device as claimed in Claim 1, wherein the grooves are formed by precise
dicing.
4. The device as claimed in Claim 1, wherein the grooves are V-shaped grooves.
5. The device as claimed in Claim 1, wherein the grooves are V-shaped grooves
with flat bottom.
6. The device as claimed in Claim 1, wherein the grooves are U-shaped grooves.
7. The device as claimed in Claim 1, wherein the grooves are U-shaped grooves
with flat bottom.
8. The device as claimed in Claim 1, wherein the grooves are necktie-shaped
grooves.
9. The device as claimed in Claim 1, wherein the grooves are rhombus-shaped
grooves.

10. The device as claimed in Claim 1, wherein the lenses are ball lenses.
11. The device as claimed in Claim 1, wherein the lenses are cylindrical lenses.
12. The device as claimed in Claim 1, wherein the lenses are aspheric lenses.
13. The device as claimed in Claim 1, wherein the lenses are lenses with gradient refraction index.
14. The device as claimed in Claim 1, wherein the lenses are plano-convex lenses.
15. The device as claimed in Claim 1, wherein the lenses are lens fiber.
16. The device as claimed in Claim 1, wherein the lenses are a combination of ball lenses, cylindrical lenses, aspheric lenses, lenses with gradient refraction index, plano-convex lenses, and lens fiber.
17. The device as claimed in Claim 15, wherein the lens fiber is formed by fusing micro lens and a fiber optic.
18. The device as claimed in Claim 15, wherein the lens fiber is formed by treating the tip of a fiber optic so that the tip acts as a lens.
19. The device as claimed in Claim 15, wherein the lens fiber is a conic lens.
20. The device as claimed in Claim 15, wherein the lens fiber is a ball lens.
21. The device as claimed in Claim 15, wherein the lens fiber is an aspheric lens.
22. The device as claimed in Claim 15, wherein the lens fiber is plano-convex-shaped.
23. The device as claimed in Claim 15, wherein the lens fiber is a thermal expanded core fiber.
24. The device as claimed in Claim 15, wherein the filter is a thin-film filter.

- 25** A silicon optic based wavelength division multiplexer (WDM) device, comprising:
- a silicon substrate, having a plurality of grooves, the grooves for inserting and coupling fiber optics, lenses fiber, and filters,
 - a plurality of fiber optics, inserted and coupled inside the grooves of the silicon substrate, fiber-to-fiber coupling being done by lenses,
 - a plurality of lenses fiber, inserted and coupled inside the grooves of the silicon substrate, for coupling fiber optics, and for focusing and diverging lights, and
 - at least a filter, inserted and coupled inside the grooves of the silicon substrate, for passing or reflecting lights with different wavelengths.
- 26.** The device as claimed in Claim **25**, wherein the grooves are formed by etching.
- 27.** The device as claimed in Claim **25**, wherein the grooves are formed by precise dicing.
- 28.** The device as claimed in Claim **25**, wherein the grooves are V-shaped grooves.
- 29.** The device as claimed in Claim **25**, wherein the grooves are V-shaped grooves with flat bottom.
- 30.** The device as claimed in Claim **25**, wherein the grooves are U-shaped grooves.
- 31.** The device as claimed in Claim **25**, wherein the grooves are U-shaped grooves with flat bottom.
- 32.** The device as claimed in Claim **25**, wherein the grooves are necktie-shaped grooves.
- 33.** The device as claimed in Claim **25**, wherein the grooves are rhombus-shaped grooves.

- 34.** The device as claimed in Claim **25**, wherein the lens fiber is formed by fusing micro lens and a fiber optic.
- 35.** The device as claimed in Claim **25**, wherein the lens fiber is formed by treating the tip of a fiber optic so that the tip acts as a lens.
- 36.** The device as claimed in Claim **25**, wherein the lens fiber is a conic lens.
- 37.** The device as claimed in Claim **25**, wherein the lens fiber is a ball lens.
- 38.** The device as claimed in Claim **25**, wherein the lens fiber is an aspheric lens.
- 39.** The device as claimed in Claim **25**, wherein the lens fiber is plano-convex-shaped.
- 40.** The device as claimed in Claim **25**, wherein the lens fiber is a thermal expanded core fiber.
- 41.** The device as claimed in Claim **25**, wherein the filter is a thin-film filter.